

Ginger Root Extract Increases Mitochondrial Fission and Mitophagy in Diabetes Mellitus Rats

CASEY APPELL¹, NIGEL C. JIWAN¹, CHWAN-LI SHEN^{2,3,4}, HUI-YING LUK¹

¹Applied Exercise Physiology Laboratory, Department of Kinesiology and Sport Management; Texas Tech University; Lubbock, TX

²Department of Pathology, ³Center of Excellence for Integrative Health, ⁴Center of Excellence for Translational Neuroscience and Therapeutics; Texas Tech University Health Sciences Center; Lubbock, TX

Category: Masters

Advisor / Mentor: Luk, Hui-Ying (huiying.luk@ttu.edu)

ABSTRACT

Diabetes (DM) is accompanied by mitochondrial dysfunction (i.e., mitochondria fission/fusion and mitophagy) in which result in an accumulation of damaged mitochondria and further impaired insulin resistance. Ginger root extract (GRE) has been shown to improve mitochondrial biogenesis and decreased respiratory coefficient in DM model, however, the effect of GRE on the basal mitochondria fission/fusion and mitophagy state is limited. **PURPOSE:** To determine the effect of GRE on mitochondria fission/fusion and mitophagy transcript abundance in rats with diabetes induced by high-fat diet (HFD) with streptozotocin (STZ). **METHOD:** Sprague-Dawley rats were randomly divided into 3 groups: standard diet (STD; n=11), HFD with 35 mg/kg of STZ (DM; n=11), and HFD+STZ with 0.75% w/w GRE (GRE; n=10). After 7 weeks, soleus samples were collected and analyzed for gene expression for fission/fusion (DRP, MFN) and mitophagy (PINK1, PARKIN, BECN1, LC3A, LC3B, P62). **RESULT:** A significant ($p < 0.05$) condition effect was found for PINK1, DRP, LC3A, LC3B, P62, and autophagic flux. For fission/fusion, GRE had significantly greater DRP (2.27±0.9-fold vs. 0.47±0.1-fold) than DM and no difference was found for MFN. For mitophagy, GRE had significantly greater PINK1 (1.59±0.55-fold vs. 0.31±0.06-fold), LC3A (1.81±0.65-fold vs. 0.13±0.02-fold), LC3B (2.71±0.92-fold vs. 0.66±0.25-fold), P62 (3.25±1.24-fold vs. 0.43±0.12-fold), and autophagy flux (4.5±1.06-fold vs. 2.41±0.36-fold) than DM and greater LC3B (2.71±0.92-fold vs. 1±0.06-fold), P62 (3.25±1.24-fold vs. 1±0.21-fold), and autophagic flux (4.5±1.06-fold vs. 1±0.26-fold) than STD. No difference was found for PARKIN and BECN1. **CONCLUSION:** In DM rats, GRE increased basal expression of mitochondria fission, degradation tag (PINK1), and autophagolysosome (LC3A, LC3B, P62, autophagic flux) markers, suggesting a potential increased in mitochondrial fission and mitophagy capacity.